STATE IN THE MINISTRY OF SCIENCE AND TECHNOLOGY (SHRI BHUVNESH CHATURVEDI) : (a) Yes, Sir. India has embarked on a self-reliant space programme by developing its own capability both in satellites for applications in remote sensing, communications, mateorology, disaster warning etc., as well as in launch vehicles for launching these satellites.

(b) All systems in satellites and launch vehicles are realised indigenously including design, fabrication, testing and integration. Due to the low quatity requirement of certain space-qualified electronic components, special materials and rare chemicals' it is uneconomical to produce these indigenously in our country. Hence, as of now the percentage of foreign components is about 30% for satellites and 25% for launch vehicles, though in terms of the total cost of the projects, such percentage would be much less.

(c) and (d) Yes, Sir. Plans have been formulated to reduce further foreign input, mainly through indigenous production by involving Indian industry. Schedule depends entirely upon availability of appropriate industrial infrastructure in the country. Already over 200 technologies/processes developed by Indian Space Research Organisation (ISRO) have been transferred to Indian industry for production. Over 500 industries are participating in Indian space programme. Major space hardwares for Indian Remote Sensing Satellite (IRS), Indian National Satellite (INSAT), Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV) have been contracted out to Indian industry including private sector. The expertise and infrastructure thus built up in Indian industries are now even commercially exploited abroad through Antrix Corporation.

(e) Space technology requires special materials, rare chemicals and space qualified electronic components etc., which are of specific use either in space programme alone or in few other hi-tech areas. Investment on infrastructure to produce these in small quantity is prohibitively costly and the lead time required for productionisation, testing and qualification will be very long. Thus, it will not be economical, cost effective and schedule relevent to produce each and every item within the country itself. Launch support and tracking facilities of ground stations, located abroad, are also required while launching satellite launch vehicles as well as for orbit determination of satellites. In view of these, it is not possible to aim at zero dependency for foreign inputs at present in the space programme. This applies not only to India but even to advanced nations such as USA, France, etc.

अंतरिक्ष अनुसंधान कार्यक्रम

5020. **श्री झंकर दयाल सिंह** : क्या प्रधान मंत्री यह बताने की कृपा करेंगे कि :

(क) भारत ने अब तक कितने अंतरिक्ष संबंधी अनुसंधान कार्यक्रम पूरे किये हैं और विगत तीन वर्षों के दौरान ऐसे कितने कार्यक्रमों को अन्तिम रूप दिया गया है;

(ख) इनमें से कितने कार्यक्रम सफल हुए और कितने कार्यक्रम असफल हुए; और

(ग) पिछले तीन वर्षों के दौरान इन कार्यक्रमों पर कितनी धनराशि खर्च की गयी ?

प्रधान मंत्री कार्यालय में राज्य मंत्री विज्ञान और प्रौद्योगिकी मंत्रालय में राज्य मंत्री का अतिरिक्त प्रभार तथा परमाणु ऊर्जा विभाग और अन्तरिक्ष विभागों में राज्य मंत्री (श्री भुवनेश चतुर्वेदी) : (क) और (ख) भारत ने अभी तक निम्नानुसार 30 प्रमुख अन्तरिक्ष परियोजनाएं/कार्यक्रम पूरे किए हैं :—

— 20 उपग्रह परियोजनाएं, जिनमें से 14 सफल रही; 2 आंशिक सफल तथा 4 को प्रमोचक राकेट की असफलता के कारण कक्षा में स्थापित नहीं किया जा सका ।

— 8 प्रमोचक राकेटों का प्रमोचन, जिनमें 4 सफल रहे ।

— 2 प्रमुख प्रायोगिक कार्यक्रम — अर्थात् उपग्रह शैक्षणिक दूरदर्शन परीक्षण (साइट) और उपग्रह दूरसंचार परीक्षण परियोजना (स्टेप), ये दोनों सफल रहे ।

— प्रमुख वैज्ञानिक परियोजनाएं जैसे भारतीय मध्य वायुमण्डलीय कार्यक्रम और मध्य मण्डल-समताप-मण्डल-क्षोभमण्डल (एम. एस. टी.) राडार ।

पिछले तीन वर्षों के दौरान विभाग के मुख्य प्रयास संवर्धित उपग्रह प्रमोचक राकेट (ए. एस.एल.वी.), ध्रुवीय उपग्रह प्रमोचक राकेट (पी.एस.एल.वी.) और भू-तुल्यकाली उपग्रह प्रमोचक राकेट (जी.एस.एल.वी.) नामक प्रमोचक राकेट कार्यक्रमों और भारतीय सुदूर संवेदन उपग्रह (आई.आर.एस.) और इन्सैट-2 श्रृंखला के उपग्रह कार्यक्रमों से संबंधित थे ।

(ग) पिछले तीन वर्षों के दौरान अन्तरिक्ष अनुसंधान कार्यक्रमों पर खर्च की गई धनराशि का ब्यौरा निम्न प्रकार है :

(करोड़ रुपये में)

1991-92—460.10

1992-93—490.92

1993-94—703.98

Recommendations of the Expert Committee on the Development of Cryogenic Engine

5021. SHRI GHUFRAN AZAM : Will the PRIME MINISTER be pleased to state :

(a) whether it is a fact that the Expert Committee set up by Government to develop indigenous Cryogenic Engine had made certain recommendations in this regard;

(b) if so, what are the details thereof; and

(c) what is the decision taken by Government on these recommendations ?

THE MINISTER OF STATE IN THE PRIME MINISTER'S OFFICE AND THE MINISTER OF STATE IN THE DEPARTMENTS OF ATOMIC ENERGY AND SPACE AND THE MINISTER OF STATE IN THE MINISTRY OF SCIENCE AND TECHNOLOGY (SHRI BHUVNESH CHATURVEDI) : (a) Yes, Sir. Several teams of Department of Space (DOS)/Indian Space Research Oraganisation (ISRO) experts from various disciplines such as aerodynamics, propulsion, control, avionics, structures and mission and range safety, fabrication, materials have studied the development of a suitable indigenous cryogenic stage for Geosynchronous Satellite Launch Vehicle (GSLV).

(b) and (c) The chosen configuration including the specifications for the cryo engine and stage was based on reliability, cost effectiveness, heritage range safety requirements and maximal utilisation of Polar Satellite Launch Vehicle (PSLV) modules.

A project report was prepared based on this choice for the development of GSLV and was approved by Space Commission in August 1990. In October 1990, the then USSR made a proposal for the technology transfer of the cryogenic stage with specifications similar to those proposed earlier for the indigenous development and meeting all the requirements of GSLV. The same interdisciplinary team of experts, taking note of the advantages of this proposal prepared the revised GSLV Priject report within the over all cost envelope of the original report which was approved by the Spaces Commission & Government. Subsequent to the invoking of force majeure clause by GLAVKOSMOS of the agreement signed by ISRO with them in this regard, negotiation took place between GLAVKOSMOS and ISRO resulting in a modified Agreement deleting the technology transfer and training clauses, but obtaining additional satges. Now, with the experience and knowledge gained so far in cryo technology, ISRO has proposed to develop a Cryo stage indigenously. The Government has approved the proposal and the first indigenously built Cryo stage is expected in 1998-99 based on a success-based schedule.